INEEL/EXT-02-01412
Revision 0

Conceptual Design Study Report for TSF-26 PM-2A Tanks for Test Area North Operable Unit 1-10

January 2003

Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC

INEEL/EXT-02-01412
Revision 0

Conceptual Design Study Report for TSF-26 PM-2A Tanks for Test Area North Operable Unit 1-10

Gary E. McDannel

January 2003

Idaho National Engineering and Environmental Laboratory
Environmental Restoration Program
Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operations Office
Contract DE-AC07-99ID13727

Conceptual Design Study Report for TSF-26 PM-2A Tanks for Test Area North Operable Unit 1-10

INEEL/EXT-02-01412
Revision 0

January 2003

Approved

Gary E. McDannel (signature) — 1/13/03

Gary E. McDannel, Project Engineer
Waste Area Group 1 — Date

James E. Bruce (signature) — 1/13/03

James E. Bruce, Project Manager
Operable Unit 1-10 Comprehensive Remediation — Date

ABSTRACT

This design study evaluates whether the remedy specified in the *Final Record of Decision for Test Area North Operable Unit 1-10 Idaho National Engineering and Environmental Laboratory* for the PM-2A tanks can be executed as outlined and within the estimated cost. The selected remedy was Alternative 3d: "Soil Excavation, Tank Content Vacuum Removal, Treatment, and Disposal."

This study concludes that the remedy can be executed within the cost identified in the Operable Unit (OU) 1-10 Record of Decision. The new design approach evaluated in this study is slightly different from the one used to generate the original OU 1-10 Record of Decision cost estimate. However, each of the major remedy components remains unchanged. Therefore, it is concluded that no modification to the OU 1-10 Record of Decision is required. The detailed design for the PM-2A tanks will be prepared based on the new design approach presented in this design study report.

CONTENTS

FIGURES

TABLES

ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOE-ID	U.S. Department of Energy Idaho Operations Office
EPA	U.S. Environmental Protection Agency
FRG	final remediation goal
FY	fiscal year
ICDF	INEEL CERCLA Disposal Facility
IDW	investigation-derived waste
INEEL	Idaho National Engineering and Environmental Laboratory
LDR	land disposal restriction
OU	operable unit
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SVOC	semivolatile organic compound
TAN	Test Area North
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TSF	Technical Support Facility
UHC	underlying hazardous constituent
UTS	universal treatment standard
WAC	waste acceptance criteria
WAG	waste area group

Conceptual Design Study Report for TSF-26 PM-2A Tanks for Test Area North Operable Unit 1-10

1. INTRODUCTION

Test Area North (TAN) Waste Area Group (WAG) 1 is one of the 10 Idaho National Engineering and Environmental Laboratory (INEEL) WAGs identified in the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991) between the U.S. Department of Energy Idaho Operations Office (DOE-ID); the U.S. Environmental Protection Agency (EPA), Region 10; and the Idaho Department of Health and Welfare. The Federal Facility Agreement and Consent Order (DOE-ID 1991) lists Operable Unit (OU) 1-10 as WAG 1.

2. SCOPE AND PURPOSE

This report provides the results of a design study to review and assess the preconceptual design approach and cost estimate prepared in support of the selected remedy for the Technical Support Facility (TSF) –26 PM-2A tanks for OU 1-10 in the *Final Record of Decision for Test Area North Operable Unit 1-10 Idaho National Engineering and Environmental Laboratory* (DOE-ID 1999). The remedy selected in the OU 1-10 Record of Decision (ROD) (DOE-ID 1999) was Alternative 3d: "Soil Excavation, Tank Content Vacuum Removal, Treatment, and Disposal." Disposal of the waste would be at the INEEL CERCLA Disposal Facility (ICDF), and treatment would be performed on an as-needed basis.

Performance of this design study was prompted by the need to revise portions of the OU 1-10 ROD relative to the proposed changes to the V-Tanks (another OU 1-10 site) selected remedy. Therefore, it was decided to concurrently review the specified remedy to the PM-2A tanks to potentially avoid multiple revisions to the OU 1-10 ROD. The purpose of this study was to evaluate whether the preconceptual design approach assumed in the OU 1-10 ROD remains sound from a technical and implementation standpoint and whether the associated cost estimate remains valid. The scope of this study includes identifying areas of risk or uncertainty with the original preconceptual design approach and, as appropriate, identifying a new alternate design approach that is sound from both a technical and cost standpoint. This study further evaluates whether the new alternate design remains consistent with the remedy specified in the OU 1-10 ROD.

The process used for this study is summarized below:

- Review the original preconceptual design approach and assumptions to confirm that all necessary scope is addressed and that the approach is implementable
- Review the original cost estimate to confirm that all scope is addressed and that costs are reasonable
- Identify issues about assumptions, incomplete scope, unreasonable cost (high or low), and areas of technical risk and uncertainty
- Develop and provide resolutions to identified issues
- Develop and provide a new preconceptual design approach and assumptions that incorporate resolution to the issues
- Provide a new cost estimate based on the new preconceptual design approach and assumptions.

2.1 Description and Background of the Test Area North PM-2A Tanks

The TSF–26 PM-2A Tank site comprises two 50,000-gal carbon-steel underground storage tanks; associated concrete containment troughs; pipes; waste contents in the tanks; and contaminated soil in various locations. Each tank measures 12.5 ft in diameter by 55 ft long and lies horizontally in a concrete trough—the bottom of which is located approximately 30 ft underground. The tops of the tanks are approximately 15 ft below ground surface. Most of the liquid waste was removed from the tanks by the end of 1981, leaving heels of wet, mixed-waste sludge. The *Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A)* (Smith 1983) states that in 1981, Tank TK-710 (also known as V13 or the east tank) contained approximately 1,860 gal of sludge that was 12 in. thick and covered by 1/4 in. of liquid. Smith (1983) reports that the west tank, TK-709 (also known as V14), contained approximately 360 gal of sludge covered by 1-1/2 in. of liquid. Approximately 10,000 lb of diatomaceous earth then was deposited into each tank to absorb the remaining liquid, forming a layer estimated to be 8 in. thick (Smith 1983). The tank configuration and contents are depicted in Figure 1. A photograph of the inside of Tank V13 after the addition of diatomaceous earth is provided in Figure 2.

The OU 1-10 ROD estimates the combined waste volume of both tanks to be 3,800 gal, which includes the sludge and diatomaceous earth (DOE-ID 1999). Other estimates indicate the waste volume could be between 5,600 and 8,000 gal. Additional investigation will be conducted to more accurately determine the waste volume; however, the 5,600-gal figure was used for this study.

Tanks V13 and V14 were installed in the mid-1950s to store radioactive liquid waste concentrated by the TAN-616 and PM-2A evaporators; these tanks were removed from service in 1975. Before evaporation, the raw liquid was stored in Tanks V1, V2, and V3. From 1972 (when the TAN-616 evaporator was removed from service) until 1975, Tanks V13 and V14 received the raw liquid waste directly from Tanks V1 and V3, plus evaporator bottoms from the PM-2A evaporator. (Tank V2 was removed from service in 1968.) Collection Tanks V1 and V3 continued to receive liquid waste until 1982 and 1985, respectively.

The waste remaining in the tanks is Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.) F001-listed hazardous waste and contains radionuclides, polychlorinated biphenyls (PCBs), and inorganic substances including heavy metals. The waste also may contain various organic compounds, although the analytical results from samples obtained in 1996 are listed as undetectable (INEEL 2000). However, the detection limits exceed the concentrations corresponding to the characteristic of a toxic hazardous waste. The detection limits also exceed the land disposal restriction (LDR) treatment standards. Appendix A contains results from the 1996 sampling campaign that illustrate the limitations of the existing data, particularly the high detection levels for the organic compounds.

The soil above and in the general area of the tanks was contaminated from occasional spills during routine operations and from leaks and spills during the removal and evaporation of the liquid waste.

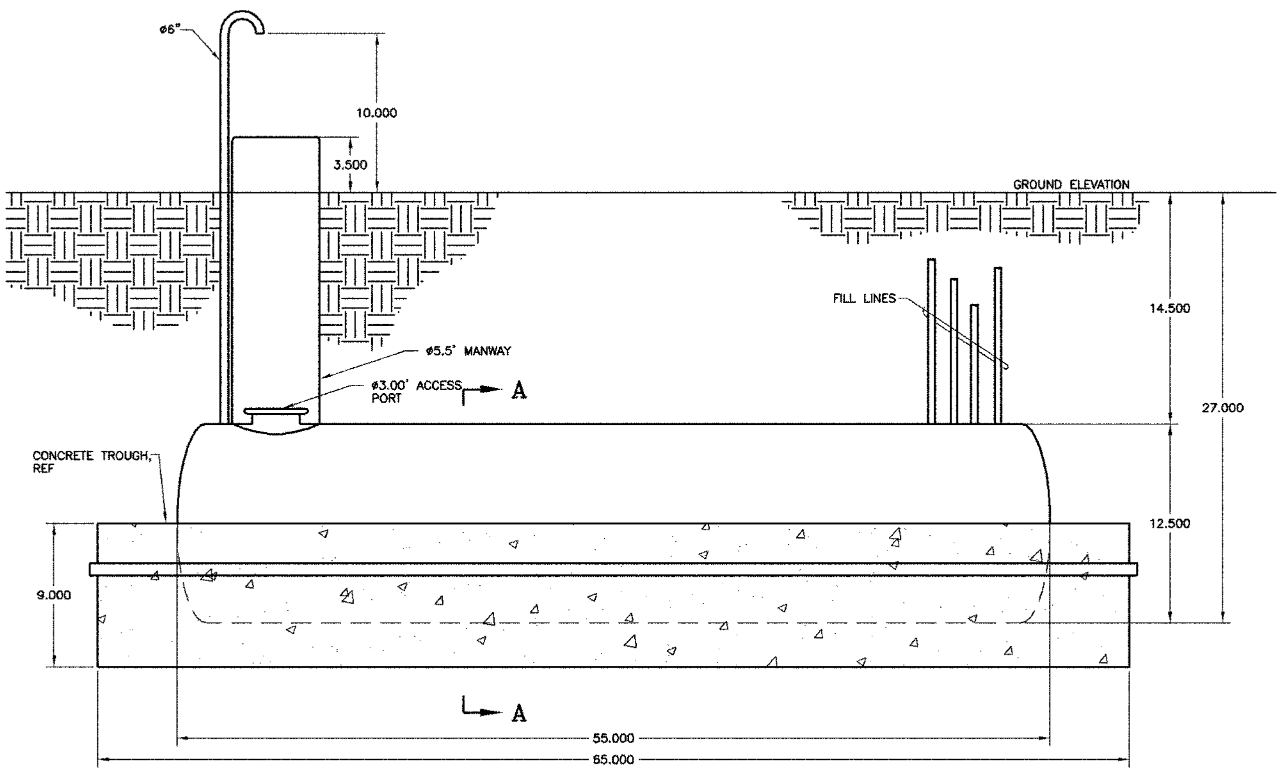
2.2 Test Area North PM-2A Tank Selected Remedy—Alternative 3d

The OU 1-10 ROD selected Alternative 3d, and the major components of the selected remedy are identified as follows:

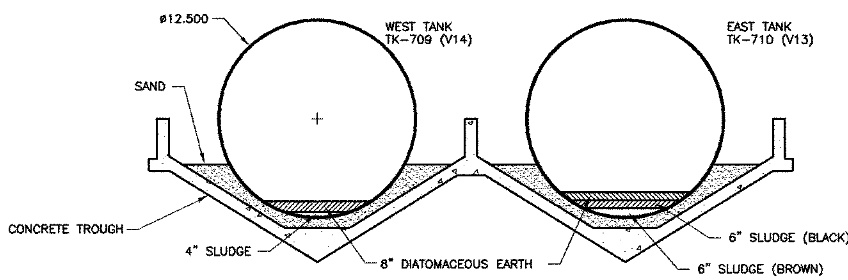
1. Excavate contaminated soil

2. Dispose of the contaminated soil at an acceptable soil repository

3. Sample tank contents



a. Elevation: Looking West at Tank 710



Note: The sludge layers were measured before the diatomaceous earth was deposited.

b. Section A–A: Looking North

Figure 1. Views of Test Area North TSF-26 PM-2A tanks.

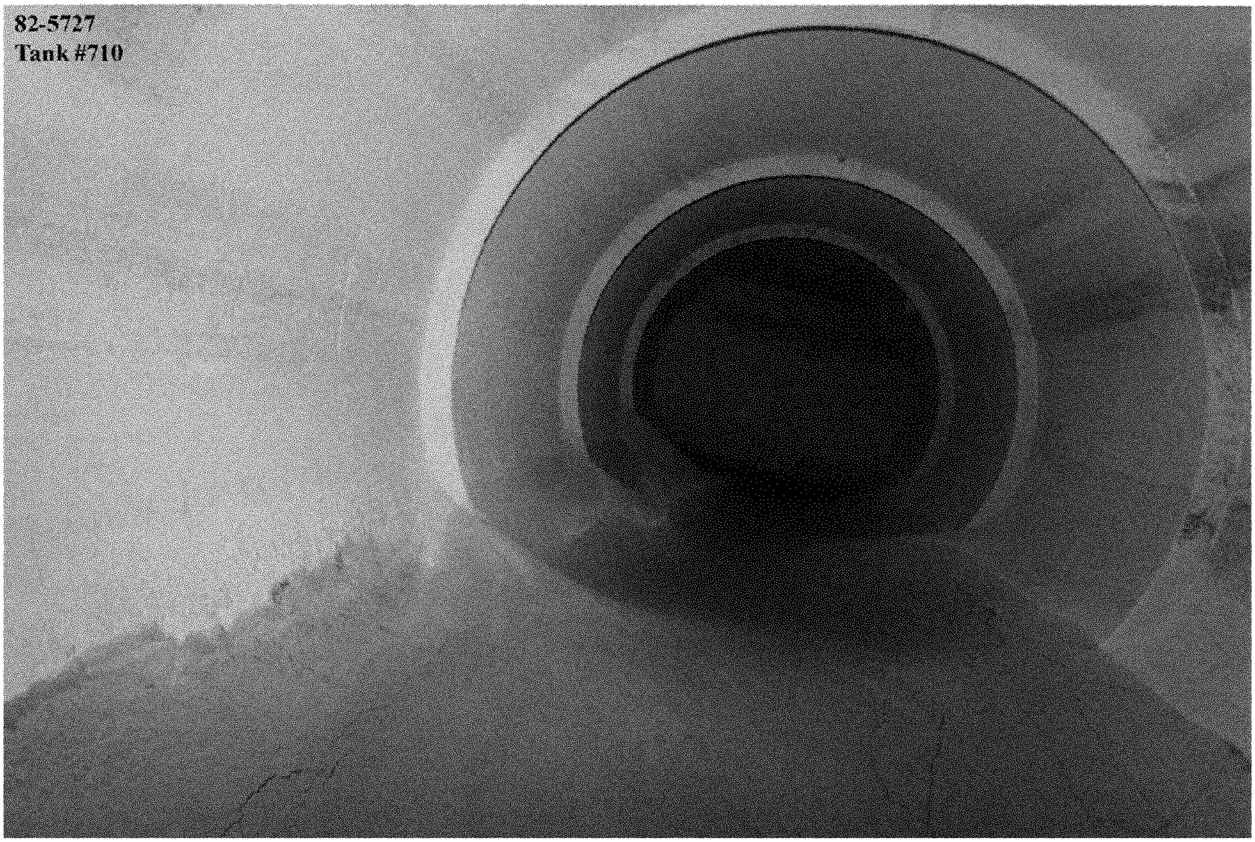


Figure 2. Photograph taken inside Tank V13 (TK-710) in 1982 after the addition of diatomaceous earth.

4. Remove tank contents using commercial vacuum excavation technology

5. Verify that the waste form does not require treatment before disposal (or treat tank contents to meet ICDF waste acceptance criteria [WAC], if necessary)

6. Dispose of the tank contents and investigation-derived waste (IDW) at an acceptable repository (or other approved facility, if necessary)

7. Decontaminate the tanks and fill with an inert material

8. Conduct postremediation sampling at the bottom of the excavation to verify final remediation goals (FRGs) are met and analyze for additional contaminants in the PM-2A tank-content waste to perform a risk analysis in support of an institutional control determination at this site

9. Fill the excavation with clean soil, then contour and grade to surrounding soil

10. Establish and maintain institutional controls consisting of signs, access control, and land-use restrictions, depending on results of the sampling activities.

Note: The first component of the OU 1-10 ROD addresses surface soils around the PM-2A tanks. This action is not addressed by this study because these soils are covered under the OU 1-10 Group 1 soil sites.

3. EVALUATION AND COMPARISON OF THE ORIGINAL PRECONCEPTUAL DESIGN APPROACH WITH THE NEW PRECONCEPTUAL DESIGN APPROACH

The original preconceptual design approach was reviewed and evaluated, and a number of potential implementation issues were identified. To address the identified issues, a new preconceptual design approach was developed. The following sections summarize the evaluation and issues identified with the original preconceptual design approach and how the new approach addresses the issues.

The new preconceptual design approach corresponds directly with each of the 10 major components (listed previously in Section 2.2) of the selected remedy for the PM-2A tanks described in the OU 1-10 ROD (DOE-ID 1999). The only design differences between the new and original approach relate to how the remedy was implemented, which affects the cost estimate discussed in Section 3. These differences are summarized in Table 1 and are described in further detail below.

3.1 Excavate Soil

The original design assumed the soil would be removed down to the top of the tanks. The new design would remove soil to the approximate midpoint of the tanks, thus allowing improved tank access as discussed in Section 3.4. It is assumed that the level of contamination will be sufficiently low to preclude the need for an enclosure over the entire area. Additional personal protective equipment may be necessary for the remediation workers, and such requirements will be established during the integrated work control process.

3.2 Dispose of Soil

No change was made between the original and new designs for disposal of the soil. All contaminated soil will be disposed of at the ICDF. The amount of soil disposed of will depend on previous and planned (using real-time analysis systems, where feasible) sampling efforts. Samples also will be obtained from areas around localized piping from which removal and disposal will be conducted, as necessary. Uncontaminated soil removed during the excavation will be stockpiled and later used for fill material. The objective is to remove and dispose of contaminated soil with higher than 23.3 pCi/g Cs-137. Confirmation sampling will be performed following removal to verify that the residual risk is below established limits (i.e., meets FRGs).

3.3 Sample Tank Contents

The original design assumed the tank contents would be homogenized and sampled during the remedial action, but the exact method was not specified. The new design approach will remove the tank contents by dislodging a vertical slice of the sludge and diatomaceous earth layers and then immediately vacuuming this material and collecting it in a suitable container (e.g., 55-gal drum). The contents removal will proceed from one end of the tank to the other. By removing the waste in this manner, the contents will be homogenized across the depth of the two layers. The only nonhomogeneity would be longitudinally in the tank and this is expected to be relatively minor. A field sampling plan will be prepared and approved that will establish requirements for necessary container sampling and analyses.

Note: Additional sampling before removal of the contents, for the purposes of confirming whether waste treatment will be required, is planned in 2003 and will be addressed in a separate field sampling plan.

Table 1. Summary comparison of original and new design approach for Test Area North PM-2A tanks.

Operable Unit 1-10 Record of Decision[a] Remedy	Original Design Approach	New Design Approach
1. Excavate soil	Excavate down to top of tanks.	Excavate down to midpoint of tanks.
2. Dispose of soil	Dispose of soil to the ICDF.	Same as original design approach.
3. Sample tank contents	Sample contents during removal.	Same as original design approach, although note that in-tank sampling may be pursued before remedial action to establish whether treatment is required.
4. Remove tank contents using vacuum extraction	Use robotic arm deployed from man-way with vacuum removal system. Collect tank contents in containers.	Remove top portion of tank to allow easier access to tank contents using solids vacuum removal system. Collect tank contents in containers.
5. Verify whether tank contents require treatment	Sample and analyze removed (homogenized) material. (Cost for treatment is not included in the OU 1-10 ROD estimate.)	Same as original design approach. (Cost for treatment is not included in the updated estimate.)
6. Dispose of tank contents and IDW	Dispose of contents and IDW to the ICDF.	Same as original design approach.
7. Decontaminate tanks and fill with inert material	Use robotic arm and vacuum removal system to remove all tank contents, avoiding wet decontamination if possible. Fill tanks with inert material.	Use solids vacuum removal system and manual methods to decontaminate the tanks, avoiding wet decontamination if possible. Place top portion of tank into bottom portion once clean. Place inert material in and around tank sections.
8. Sample underneath tanks to verify FRGs are met and to establish institutional controls	Sample underneath tanks to confirm that FRGs are met (assuming no removal is required) and establish required institutional controls in accordance with RCRA closure plan.	Sample underneath tanks to confirm FRGs and clean closure requirements are met. Sampling underneath the tanks within the concrete saddles also is planned before remedial action to establish whether contamination exists adjacent to or under the tanks.
9. Fill with clean soil	Fill with clean soil.	Same as original design approach.
10. Establish institutional controls as required	Establish institutional controls as required.	If clean closure requirements are met, then no institutional controls will be required.

a. DOE-ID (1999).
DOE-ID = U.S. Department of Energy Idaho Operations Office
FRG = final remediation goal
ICDF = INEEL CERCLA Disposal Facility
IDW = investigation-derived waste
OU = operable unit
RCRA = Resource Conservation and Recovery Act (42 USC § 6901 et seq.)
ROD = Record of Decision (DOE-ID 1999)

3.4 Remove Tank Contents Using Vacuum Extraction

The original design approach assumed in the OU 1-10 ROD cost estimate used a robotic arm deployed through the man-way to remotely maneuver a vacuum removal system. The new design removes the top portion (approximately one-half) of the tanks, which eliminates the complexity associated with the robotic arm. This will be particularly beneficial for removal of material around the four 7-in.-wide structural rings spaced at 11-ft intervals within each tank. Based on current samples, it is estimated that the radiation fields (i.e., 11 mR/hour at 1 m for a 55-gal drum) will be sufficiently low such that a manually operated vacuum removal system can be deployed.[a] Similar commercially available systems have been used successfully at the INEEL. For example, one such system uses an air lance and vacuum system to dislodge and remove waste material. The air lance can be adjusted to sufficiently high pressures such that complete removal of the waste is expected. The vacuum system discharges to a 55-gal drum that is vented through a high-efficiency particulate air filter. To minimize the spread of airborne contamination during contents removal, application of a fine water spray/mist at the digface will be investigated during the design process. The operator will be required to wear appropriate personal protective equipment. In the event the vacuum system is incapable of removing all of the waste, additional manual and mechanical removal techniques will be deployed. To minimize secondary waste generation, attempts will be made to collect the waste in containers that also can be used for disposal at the ICDF. In addition, it is likely that a ventilated enclosure over the tank will be required during the removal action, and this is included in the cost estimate.

3.5 Verify Whether Tank Contents Require Treatment

The new and original approaches and associated cost estimates assumed that the tank contents would not require treatment. While this cannot be verified with existing data, no evidence confirms that treatment is required. Furthermore, using inferences from similar waste forms, the assumption that treatment will not be required does not appear unreasonable.

Existing analytical data include only total constituent concentrations. No toxicity characteristic leaching procedure (TCLP) analysis was performed. Therefore, using existing total constituent data to determine if the waste meets LDR treatment standards would be overly conservative. One method acknowledged by the EPA, *Test Methods for Evaluating Solid Waste Physical/Chemical Methods* (EPA 1986), is to divide the total constituent concentration by 20. Because of the analytical method used to obtain the TCLP concentration, this approach provides the maximum possible TCLP concentration assuming 100% leachability of the constituent in question. Table A-1 in Appendix A provides the data from this analysis. As shown (see Table A-1, Column 8), this method indicates most constituents would fail TCLP. Because the above method (divide-by-20 rule [EPA 1986]) only provides an upper-bound estimate, other approaches to provide best engineering judgment were investigated. Because the majority of the sludge in the PM-2A tanks originated from the V-Tanks, the leachability ratio (i.e., TCLP concentration divided by total concentration) of the V-Tank sludge was used as a reasonable means to estimate the expected leachability of the waste from the PM-2A tanks. These data also are presented in Table A-1 of Appendix A. Using this approach and recognizing the limitations of such an analogy, the estimated TCLP analyses for all the hazardous metals pass the regulatory limits by at least an order of magnitude (see Table A-1, Column 11). However, several of the organic constituents fail TCLP.

The concentration of the RCRA-characteristic organics identified in 40 *Code of Federal Regulations* (CFR) 261.24, "Toxicity Characteristic," in the PM-2A tank contents is unknown. All of the concentrations are U-flagged (i.e., undetected). The difficulty with the data is that the detection levels cited are higher than the regulatory level in all cases. Consequently, it is impossible to determine the actual concentrations with certainty. Once again, it was necessary to make a determination based on best engineering judgment of existing data and process knowledge.

Because the PM-2A tanks potentially contain the residues of spent chlorinated solvents (e.g. trichloroethene [TCE]), the waste in these tanks is classified as F001 listed. This triggers the requirement to meet LDR treatment standards for the F-series solvents in 40 CFR 268.40, "Applicability of Treatment Standards." This treatment standard sets concentration-based standards for 27 different

---

a. D. J. Sorenson, BBWI, personal communication to Tom McDonald, BBWI, "Microshield Calculations," September 16, 2002.

organic compounds in the sludge. These compounds and their associated treatment standards are listed in Table A-2a. Because the majority of waste collected in the PM-2A tanks was treated (evaporated) in either the TAN-616 or PM-2A evaporators, it is likely that suspected F001 solvents, TCE, or tetrachloroethene are not present in the sludge layer at hazardous levels because of their relatively low boiling points. Only two semivolatile organic compounds (SVOCs) (i.e., PCBs and bis 2-ethylhexyl phthalate) were found above the detection limit in the V-Tank sludge. These two contaminants are identified only as underlying hazardous constituents (UHCs) in RCRA. Therefore, LDRs on these constituents are not imposed unless the waste is found to be characteristically hazardous for other (non-F001) constituents. Because the waste in the PM-2A tanks came from the V-Tanks, it would not be unexpected that PM-2A tank contents would be free of hazardous levels of organics.

Tables A-2a, A-2b, and A-2c in Appendix A compare the PM-2A tank analytical data to treatment standards for F001 solvents, volatile organic compounds or SVOCs, and metals, respectively. Note that because the waste is listed, the LDR treatment standards for the F001-listed organic solvents in Table A-2a are applicable. However, the universal treatment standards (UTSs) do not apply unless the waste is found to be characteristically hazardous. In the event the waste is characteristically hazardous for non-F001 constituents (e.g., vinyl chloride) that invoke the UTS, only one of the metals (i.e., cadmium) fails the UTS as shown by Table A-2c (see Appendix A). Again, because of the high detection levels on the organics, it remains uncertain if the waste is characteristically hazardous for these organic constituents. Table A-3 in Appendix A compares the concentrations of radionuclides against the 10 CFR 61.55, "Waste Classification," to determine if it will be classified as Class A, B, or C waste. The data indicate the waste would be Class B (primarily because of the strontium content), which is acceptable for disposal in the ICDF without additional treatment. The transuranic limit for ICDF of 10 nCi/g also is met. The estimated dose rate at 1 m for a 55-gal drum of waste was estimated to be 11 mR/hour, which is well below the ICDF contact-handled waste limit of 500 mR/hour at 1 m (see footnote a).

The above analysis for estimating whether PM-2A tank contents are characteristically hazardous certainly is not conclusive. The tank contents are RCRA listed because of the potential presence of TCE. However, because process knowledge indicates the majority of the waste was evaporated, there is reasonable likelihood that the LDR limit for TCE of 6 ppm may not be exceeded. Therefore, based on reasonable assumptions, inferences, and process knowledge, insufficient evidence exists to overturn the assumption in the OU 1-10 ROD (DOE-ID 1999) that the waste will not require treatment before disposal. This assumption is consistent with the new and original design approaches.

In the event this assumption is incorrect, treatment may be necessary. The type of treatment cannot be determined until the constituents that fail TCLP are identified. If the waste is found to be characteristically hazardous, then additional treatment (e.g., thermal or chemical oxidation or reduction, or stabilization) may be necessary. One possible option for treatment is to use the treatment system planned for the V-Tank waste. If treatment is required, the waste will be collected in containers and placed in interim storage until a suitable treatment process is identified. It should be emphasized that this report acknowledges the potential need for treatment, but it concludes that sufficient data are not available to determine if and how this treatment should occur and defers this judgment until the waste has been resampled. Because of this uncertainty, sampling of the PM-2A tanks is planned before the remediation efforts to allow time for the design of any necessary treatment system. (See the note in Section 3.3.)

3.6 Dispose of Tank Contents and Investigation-Derived Waste

Both the original and new designs assumed the tank contents and IDW would be disposed of at the ICDF on confirmation of compliance with ICDF WAC. Because the waste is known to be RCRA listed (F001), disposal must meet applicable LDRs as well as other ICDF requirements. In addition, it is possible that this waste could qualify as soil, in which case alternative LDR standards apply (i.e., 40 CFR 268.49, "Alternative LDR Treatment Standards for Contaminated Soil").

3.7 Decontaminate Tanks and Fill with Inert Material

The original method for decontaminating the interior of the tanks was not specified other than use of the vacuum system and avoidance of wet decontamination, if possible. The new approach will benefit through improved access to all areas of the tanks by removing the top portion of the tanks. The removal system, with a combined air lance and vacuum system, is expected to be capable of completely removing the waste without the use of wet decontamination even if minor corrosion has occurred to the walls of the carbon steel tanks. In the event this removal system does not adequately decontaminate the tanks, other dry systems (e.g., frozen carbon dioxide pellet system) will be employed. The final method for determining sufficient decontamination will be outlined and approved in the associated RCRA closure plan for the PM-2A tank site.

As planned originally, once the tank interiors are verified clean, the upper portion of the tank will be inverted and placed inside the lower portion. Then, an inert material (e.g., sand or other soil) will be placed in and around the tank sections. An alternative approach would size and dispose of the top portion of the tank to the ICDF. However, to remain consistent with the specified OU 1-10 ROD remedy, the bottom portion, as a minimum, must be decontaminated and remain in place.

3.8 Sample Underneath Tanks to Verify Functional Restoration Guidelines Are Met and to Establish Institutional Controls

Both design approaches will sample the soil and fill material underneath the tanks to verify that FRGs are met. Both approaches assume removal will not be necessary. However, because of limited sample data, the current plan is to obtain preliminary samples within the cradle area before remedial action to establish whether subsequent removal is likely. Note that previous water samples obtained from within the cradles through a sand-point well indicate some potential contamination. However, Cs-137 (for example) was measured at 0.026 pCi/g, which is below the action level of 23.3 pCi/g by nearly three orders of magnitude (DOE-ID 1997). In the event contamination is found, a risk assessment will be performed to determine whether the soil and cradles must be excavated and removed for disposal. Note that the depth of these soils and cradles is approximately 20 ft below grade surface, thereby minimizing the intruder scenarios. Confirmation sampling is still planned following remedial action to verify that FRGs and clean closure requirements are met in accordance with the RCRA closure plan.

3.9 Fill with Clean Soil

Both design approaches call for backfilling the area, as necessary, with clean soil to match the topography of the existing area.

3.10 Establish Institutional Controls As Required

Although both the original and new approaches are consistent with this final component of the OU 1-10 ROD, the new approach will specifically work to achieve clean closure and avoid the need for institutional controls following remedial action and confirmation sampling.

A summary-level logic diagram for the new design approach is provided in Figure 3.

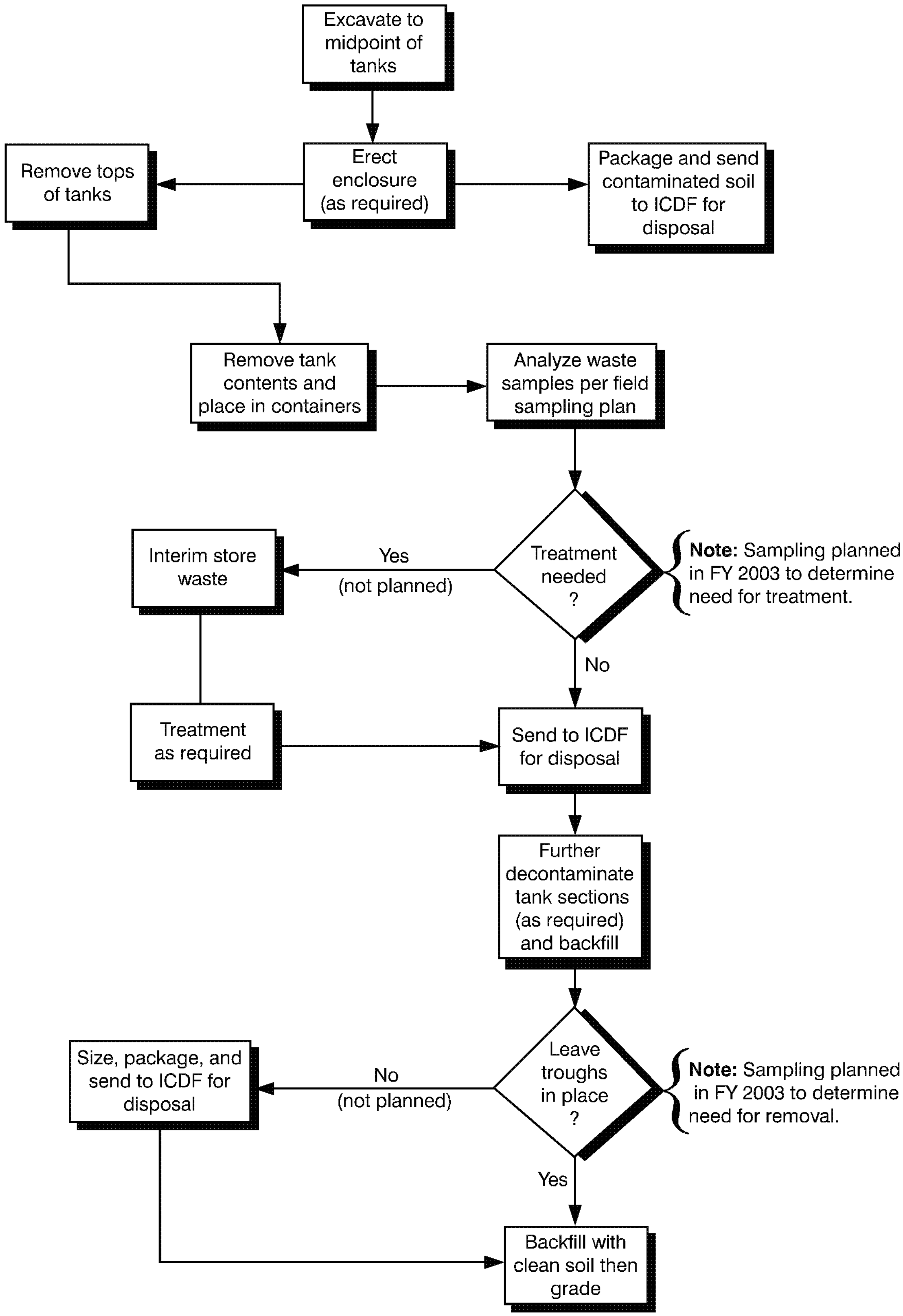


Figure 3. Summary-level logic diagram for the modified (new) remediation plan for the Test Area North PM-2A tanks.

4. COST COMPARISONS

Table 2 compares the principal cost elements of Alternative 3d, as included in the OU 1-10 ROD original preconceptual design, to the new preconceptual design approach. To ensure a valid comparison based on equivalent scope, it was necessary to reduce the original OU 1-10 ROD estimate of $6.6 million by $1.97 million. This difference was the cost associated with Group 1 sites (TSF-06 and TSF-26) soil removal, which the new cost estimate does not include.

This new cost estimate of $4.9 million is within the assumed accuracy of the original estimate (i.e., +50% [$6.9 million] and –30% [$3.2 million]). Consequently, the revised cost estimate does not constitute a revision to the OU 1-10 ROD. Although the new estimate shown in the table is slightly more than the original estimate (by $260K), it is anticipated that the project, with the new design approach, will actually result in reduced costs. This is because the estimated cost for the remedial assessment document preparation, title design package, and remedial design document was $1.5 million; however, recently obtained estimates (actual costs and bids) on this work are substantially less (by approximately 50%).

Table 2. Cost comparisons between the original and new preconceptual design approaches.

Item	Original Cost Estimate ($)	New Cost Estimate ($)	Notes
WAG 1 management	425,556	245,671	—
Construction oversight	341,851	583,399	—
Construction project manager	569,751	44,953	—
Remedial assessment document preparation	24,233	307,719	The original estimate was understated. The new estimate is based on comparable projects, but recent bids are considerably less.
Remedial assessment report	10,880	76,171	—
Packaging and shipping documentation	19,512	Included in removal and disposal of tanks.	—
5-year review	39,474	Not included.	—
Title design package	84,960	923,157	The original estimate was understated. The new estimate is based on comparable projects, but recent bids are considerably less.
Remedial design document	31,928	307,719	The original estimate was understated. The new estimate is based on comparable projects, but recent bids are considerably less.
Prefinal inspection report	8,000	12,100	—
Site preparation	656,000	1,010,143	—
Tank waste treatment	Not included	Not included.	Original and new estimate assume treatment will not be necessary.

Table 2. (continued).

Item	Original Cost Estimate ($)	New Cost Estimate ($)	Notes
Soil excavation and disposal	845,800	179,197	The original estimate assumed off-site disposal, whereas the new estimate is based on ICDF disposal.
Support materials and labor	393,000	Included in site preparation.	—
Subcontract indirect costs	1,121,971	Not included.	Assume not using a subcontract.
Packaging and disposal of tank waste	Included in subcontract	Included in removal and disposal of tanks.	—
Remove tank waste	Included in subcontract +$489,500	43,679	In the original estimate, $489,500 was incorrectly assigned to tank waste treatment costs, but was instead associated with contents removal.
Decontamination tanks	Included in subcontract	25,398	—
Removal and disposal of tanks	Included in subcontract	188,004	—
Packaging and disposal of contaminated soil	Included in subcontract	76,292	—
Backfill and grade	Included in subcontract	75,174	—
Subtotal	**5,062,416**	**4,098,776**	—
30% contingency	1,518,725	768,054	Does not include contingency for remedial design and remedial assessment document preparation because this is already budgeted for FY 2003.
Total	**6,581,141**	**4,866,830**	Difference of $1,714,311.
Group 1 sites soil removal	**(1,974,342)**		30% of the total ($6,581,141) was associated with Group 1 site soil removal, which was excluded from the new estimate.
Revised Total	**4,606,799**	**4,866,830**	Difference of ($260,031).

FY = fiscal year
ICDF = INEEL CERCLA Disposal Facility
WAG = waste area group

5. CONCLUSIONS AND PM-2A TANKS DESIGN PATH FORWARD

The review and evaluation of the original preconceptual design approach has resulted in issues being identified with a number of the design elements. During this study, a new preconceptual design approach was developed that resolves the issues with the original design approach. In addition, a new cost estimate was prepared based on the new design approach, and the new estimate compares favorably with the original estimate presented in the OU 1-10 ROD.

Finally, because the new design approach aligns with each of the major remedy components of the OU 1-10 ROD and is within the accuracy of the original cost estimate, no modifications to the OU 1-10 ROD are necessary.

Detailed design of the PM-2A tanks remedial action will proceed based on the new preconceptual design approach presented in Section 3.

6. REFERENCES

42 USC § 6901 et seq., 1976, "Resource Conservation and Recovery Act (Solid Waste Disposal Act)," *United States Code*, October 21, 1976.

42 USC § 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code*, December 11, 1980.

10 CFR 61.55, 2002, "Waste Classification," *Code of Federal Regulations*, Office of the Federal Register, December 2002.

40 CFR 261.24, 2002, "Toxicity Characteristic," *Code of Federal Regulations*, Office of the Federal Register, December 2002.

40 CFR 268.40, 2002, "Applicability of Treatment Standards," *Code of Federal Regulations*, Office of the Federal Register, November 2002.

40 CFR 268.49, 2002, "Alternative LDR Treatment Standards for Contaminated Soil," *Code of Federal Regulations*, Office of the Federal Register, November 2002.

DOE-ID, 1999, *Final Record of Decision for Test Area North Operable Unit 1-10 Idaho National Engineering and Environmental Laboratory,* DOE/ID-10682, Rev. 0, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, December 1999.

DOE-ID, 1997, *Comprehensive Remedial Investigation Feasibility Study for the Test Area North Operable Unit 1-10 at the Idaho National Engineering and Environmental Laboratory*, DOE/ID-10557, Rev. 0, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, November 1997.

DOE-ID, 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory,* Administrative Record No. 1088-06-29-120, U.S. Department of Energy Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, December 1991.

EPA, 1986, *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, Third Edition, EPA SW-846, U.S. Environmental Protection Agency, November 1986.

INEEL, 2000, *Data Quality Objectives Summary Report for the PM-2A Tanks (TSF-26)*, EDF-ER-217, INEEL/EXT-2000-01099, Rev. 0, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, December 2000.

Smith, Donald L., 1983, *Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A),* EGG-2236, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, March 1983.

Appendix A

Data Tables

Appendix A

Data Tables

A.1 DATA TABLE PREPARATION

The data tables in this appendix were prepared in an attempt to determine if the mixed waste contained in Tanks V13 and V14 could be disposed of without treatment at the INEEL CERCLA Disposal Facility (ICDF). For disposal at the ICDF, the radiological content of the waste must not exceed Class C for beta-gamma emitters and 10 nCi/g for alpha-emitting, transuranic radionuclides whose half-lives exceed 20 years. For the waste determined to be characteristically hazardous, the Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.) land disposal restriction (LDR) universal treatment standards for underlying hazardous constituents (UHCs) must be met. Table A-1 summarizes the toxic characteristic hazardous waste determinations and the methods used to estimate toxicity characteristic leaching procedure (TCLP) concentrations. Table A-2 determines if the treatment standards are met in the event that the waste is determined to be characteristically hazardous. Table A-3 summarizes the radioactive waste classification for each radionuclide for which data are available.

All of the data for the PM-2A tanks (Tanks V13 and V14) were reported in the *Data Quality Objectives Summary Report for the PM-2A Tanks (TSF-26)* (Idaho National Engineering and Environmental Laboratory [INEEL] 2000). The only data used were from samples taken from Tank V13 in September 1996. No analytical data for Tank V14 were available from the September 1996 sampling. No TCLP analyses were completed, only total constituent concentrations. All of the total organic data were coded as undetectable, yet the detection limits of the data exceeded allowable TCLP concentrations as well as applicable LDR treatment standards in many cases. Other issues and uncertainties about the quality of these data include the (1) small number of samples taken (i.e., two), (2) variability of data for metals, (3) methods for obtaining samples, (4) location where samples were obtained, and (5) method by which samples were analyzed.

All data for Tanks V1, V2, and V3 used in the tables are from the "Statement of Work for the Removal, Treatment, and Disposal of V-Tank Wastes and Associated Equipment" (INEEL 2001).

A.2 EXPLANATION OF TABLE A-1

Table A-1 summarizes the hazardous waste determinations for the waste in Tank V13. The following are descriptions for each column in the table:

- **Column 1** identifies the contaminant.
- **Column 2** contains the maximum allowable TCLP concentration for each contaminant.
- **Column 3** represents the larger of the two total-concentration data from Tank V13.
- **Column 4** contains the TCLP concentration as estimated by the divide-by-20 rule (U.S. Environmental Protection Agency [EPA] 1986) (i.e., data in Column 3 are divided by 20).
- **Column 5** contains the pass or fail determination that indicates whether the contaminant was above or below the TCLP limit in Column 2, as determined by the divide-by-20 rule as shown in Column 4.

- **Column 6** contains the average of the two total-concentration data plus one standard deviation (avg+stdy) for each contaminant. This is an indicator of the variation between data.

- **Column 7** contains the TCLP concentration estimated by the divide-by-20 rule, using the data from Column 6.

- **Column 8** contains the pass or fail determination as determined by the divide-by-20 rule for Column 7 relative to the TCLP limits in Column 2.

- **Column 9** presents the ratios of the average TCLP sludge data divided by the average total-concentration sludge data from Tanks V1, V2, and V3. Because the principal source of sludge in the PM-2A tanks is from the V-Tanks, this leachability ratio provides an estimate of the expected TCLP concentration for the PM-2A tank contents.

- **Column 10** represents the TCLP concentrations estimated by multiplying data in Column 3 by ratios in Column 9.

- **Column 11** contains the pass or fail determination from results obtained by comparing data in Column 10 with the limits in Column 2.

A.3 EXPLANATION OF TABLE A-2

Table A-2 is a three-part table that compares hazardous constituent data from Tank V13 to the appropriate treatment standard that must be used if the waste is determined to be hazardous.

The first part, Table A-2a, compares the average total concentration for each F001-listed solvent hazardous constituent in Tank V13 to the RCRA LDR treatment standard. The last column indicates whether that contaminant passed or failed.

The second part, Table A-2b, compares the average total concentration for each organic compound listed as an organic UHC (for characteristic waste codes) in V13 to the RCRA LDR universal treatment standards. The last column indicates whether that contaminant passed or failed.

The third part, Table A-2c, compares the inorganic UHCs of the characteristic waste codes for Tank V13 data to the RCRA LDR universal treatment standards, or TCLP in this case (see column description in Section A.2). Three sets of Tank-V13 data are used, which represent the three methods of estimating TCLP described for Table A-1.

Table A-1. Hazardous waste determination by estimated toxicity characteristic leach procedure concentrations.

1	2	3	4	5	6	7	8	9	10	11
Contaminant	Hazardous Waste Determination (TCLP limit) (mg/L)	Tank V13 Total (highest) (mg/kg)[a]	Total Divided by 20[b] (mg/L)	Pass or Fail	Tank V13 Total Concentration: (avg+stdv)[c] (mg/kg)	Tank V13 Total Concentration: (avg+stdv)[c] Divided by 20[b] (mg/L)	Pass or Fail	Tanks V1, V2, and V3 Average. Leach Ratio	Calculated TCLP Leach Concentration[d] (mg/L)	Pass or Fail
Benzene	0.500	220.0	11.0	Fail	222.1	11.1	Fail	6.4E-01	140.0	Fail[e]
Carbon tetrachloride	0.500	220.0	11.0	Fail	222.1	11.1	Fail	6.4E-01	140.0	Fail[e]
Chlorobenzene	100.000	220.0	11.0	Pass	222.1	11.1	Pass	6.4E-01	140.0	Fail[e]
Chloroform	6.000	220.0	11.0	Fail	222.1	11.1	Fail	6.4E-01	140.0	Fail[e]
o-Cresol	200.000	Not analyzed	—	—	—	—	—	No data	—	—
m-Cresol	200.000	Not analyzed	—	—	—	—	—	No data	—	—
p-Cresol	200.000	Not analyzed	—	—	—	—	—	No data	—	—
Cresol	200.000	Not analyzed	—	—	—	—	—	No data	—	—
1,4-Dichlorobenzene	7.500	170.0	8.5	Fail	218.3	10.9	Fail	No data	—	—
1,2-Dichloroethane	0.500	220.0	11.0	Fail	222.1	11.1	Fail	6.4E-01	140.0	Fail[e]
1,1-dichloroethylene	0.700	220.0	11.0	Fail	222.1	11.1	Fail	6.4E-01	140.0	Fail[e]
2,4-Dinitrotoluene	0.130	210.0	10.5	Fail	218.3	10.9	Fail	No data	—	—
Heptachlor	0.008	Not analyzed	—	—	—	—	—	No data	—	—
Hexachlorobenzene	0.130	210.0	10.5	Fail	218.3	10.9	Fail	No data	—	—
Hexachlorbutadiene	0.500	210.0	10.5	Fail	218.3	10.9	Fail	No data	—	—
Hexachloroethane	3.000	210.0	10.5	Fail	218.3	10.9	Fail	No data	—	—
2-Butanone	200.000	220.0	11.0	Pass	222.1	11.1	Pass	6.4E-01	140.0	Fail[e]
Nitrobenzene	2.000	210.0	10.5	Fail	218.3	10.9	Fail	No data	—	—
Pentachlorophenol	100.000	1,000.0	50.0	Pass	1035.2	51.8	Pass	No data	—	—
Pyridine	5.000	210.0	10.5	Fail	218.3	10.9	Fail	No data	—	—

Table A-1. (continued).

1	2	3	4	5	6	7	8	9	10	11
Contaminant	Hazardous Waste Determination (TCLP limit) (mg/L)	Tank V13 Total (highest) (mg/kg)[a]	Total Divided by 20[b] (mg/L)	Pass or Fail	Tank V13 Total Concentration: (avg+stdv)[c] (mg/kg)	Tank V13 Total Concentration: (avg+stdv)[c] Divided by 20[b] (mg/L)	Pass or Fail	Tanks V1, V2, and V3 Average. Leach Ratio	Calculated TCLP Leach Concentration[d] (mg/L)	Pass or Fail
Tetrachloroethene	0.700	220.0	11.0	Fail	222.1	11.1	Fail	1.2E-02	2.7	Fail
Trichloroethene	0.500	220.0	11.0	Fail	222.1	11.1	Fail	1.9E-00	420.0	Fail[e]
2,4,5-Trichlorophenol	400.000	1,000.0	50.0	Pass	1,035.2	51.8	Pass	No data	—	—
2,4,6-Trichlorophenol	2.000	210.0	10.5	Fail	218.3	10.9	Fail	No data	—	—
Vinyl chloride	0.200	220.0	11.0	Fail	222.1	11.1	Fail	6.4E-01	140.0	Fail[e]
Arsenic	5.000	27.6	1.4	Pass	25.0	1.3	Pass	3.0E-03	7.5E-02	Pass[g]
Barium	100.000	102.0	5.1	Pass	77.5	3.9	Pass	7.0E-03	5.4E-01	Pass[g]
Cadmium	1.000	70.7	3.5	Pass	49.2	2.5	Pass	3.6E-03	1.8E-01	Pass[g]
Chromium	5.000	875.0	43.8	Fail	676.6	33.8	Fail	4.8E-04	3.2E-01	Pass[g]
Lead	5.000	594.0	29.7	Fail	439.8	22.0	Fail	2.7E-05	1.2E-02	Pass[g]
Mercury	0.200	79.7	4.0	Fail	70.8	3.5	Fail	1.2E-06	8.5E-05	Pass[g]
Selenium	1.000	4.7	0.2	Pass	4.8	0.2	Pass	1.7E-02	8.2E-02	Pass[g]
Silver	5.000	144.0	7.2	Fail	104.6	5.2	Fail	1.6E-05	1.7E-03	Pass[g]

a. All organic compounds were undetected (U); values represent maximum possible concentrations.
b. EPA (1986).
c. Used the average total concentration data plus one standard deviation.
d. Calculated value is the maximum due to U-flags on the TCLP data.
e. Calculated value is the maximum due to U-flags on the organic data.
f. Anomalous data: TCLP leach ratio is greater than 1/20.
g. Assumes Tank V13 waste leaches at a rate similar to waste in Tanks V1, V2, and V3.
TCLP = toxicity characteristic leaching procedure

Table A-2a. Comparison of Tank V13 F001-listed solvent hazardous constituents subject to Resource Conservation and Recovery Act land disposal restriction treatment standards.

F001 Waste Code			
Hazardous Constituent[a]	Treatment Standard (total mg/kg)	Average Tank V13 Concentration[b] (mg/kg)	Pass or Fail
Acetone	160.0	215	Fail
Benzene	10.0	215	Fail
N-Butyl alcohol	2.6	No data	—
Carbon tetrachloride	6.0	215	Fail
Chlorobenzene	6.0	215	Fail
Total Cresol	11.2	No data	—
o-Dichlorobenzene	6.0	190	Fail
Ethyl acetate	33.0	No data	—
Ethyl benzene	10.0	215	Fail
Ethyl ether	160.0	No data	—
Isobutyl alcohol	170.0	No data	—
Methylene chloride	30.0	215	Fail
2-Butanone	36.0	215	Fail
4-Methyl-2-pentanone	33.0	215	Fail
Nitrobenzene	14.0	190	Fail
Pyridine	16.0	190	Fail
Tetrachloroethene	6.0	215	Fail
Toluene	10.0	215	Fail
1,1,1-Trichloroethane	6.0	215	Fail
1,1,2-Trichloroethane	6.0	215	Fail
1,1,2-Trichloro-1,2,2-trifluoroethane	30.0	No data	—
Trichoroethene	6.0	215	Fail
Trichloromonofluoromethane	30.0	No data	—
Xylenes	30.0	215	Fail

a. These hazardous constituents apply to the F001 hazardous waste code only.
b. The average concentration is calculated from two U-coded (non-detect) concentrations. The actual concentration may be much lower.

Table A-2b. Comparison of Tank V13 organic compound data to Resource Conservation and Recovery Act land disposal restriction universal treatment standards.

Characteristic Waste Codes			
Organic Underlying Hazardous Constituent[a]	Treatment Standard (total mg/kg)	Average V13 Concentration[b] (mg/kg)	Pass or Fail
Chloromethane	30.0	215.00	Fail
Bromomethane	15.0	215.00	Fail
Vinyl chloride	6.0	215.00	Fail
Choroethane	6.0	215.00	Fail
Carbon disulfide	4.8 (TCLP)	215.00	Fail
1,1-Dichloroethene	6.0	215.00	Fail
1,1-Dichloroethane	6.0	215.00	Fail
1,2-Dichloroethene (total)	30.0	215.00	Fail
Chloroform	6.0	215.00	Fail
1,2-Dichloroethane	6.0	215.00	Fail
Bromodichloromethane	15.0	215.00	Fail
Trans-1,3-Dichloropropene	18.0	215.00	Fail
1,1,2,2-tetrachloroethane	6.0	215.00	Fail
1,2,4-Trichlorobenzene	19.0	190.00	Fail
1,3-Dichlorobenzene	6.0	190.00	Fail
1,4-Dichlorobenzene	6.0	190.00	Fail
2,4,5-Trichlorophenol	7.4	915.00	Fail
2,4,6-Trichlorophenol	7.4	190.00	Fail
2,4-Dichlorophenol	14.0	190.00	Fail
2,4-Dimethylphenol	14.0	190.00	Fail
2,4-Dinitrophenol	160.0	915.00	Fail
2,4-Dinitrotoluene	140.0	190.00	Fail
2,6-Dinitrotoluene	28.0	190.00	Fail
2-Chloronapthalene	5.6	190.00	Fail
2-Chlorophenol	5.7	190.00	Fail
2-Nitroaniline	14.0	915.00	Fail
2-Nitrophenol	13.0	190.00	Fail
4-Chloroaniline	16.0	190.00	Fail
4-Nitroaniline	28.0	915.00	Fail
4-Nitrophenol	29.0	915.00	Fail
Acenapthene	3.4	190.00	Fail
Acenapthylene	3.4	190.00	Fail
Anthracene	3.4	190.00	Fail
Benzo(a)anthracene	3.4	190.00	Fail

Table A-2b. (continued).

Characteristic Waste Codes			
Organic Underlying Hazardous Constituent[a]	Treatment Standard (total mg/kg)	Average V13 Concentration[b] (mg/kg)	Pass or Fail
Benzo(a)pyrene	3.4	190.00	Fail
Benzo(b)fluoranthene	6.8	190.00	Fail
Benzo(g,h,I)perylene	1.8	190.00	Fail
Benzo(k)fluoranthene	6.8	190.00	Fail
Butylbenzylphthalate	28.0	915.00	Fail
Chrysene	3.4	190.00	Fail
Di-n-butylphthalate	28.0	190.00	Fail
Di-n-octylphthalate	28.0	190.00	Fail
Dibenz(a,h)anthracene	8.2	190.00	Fail
Diethylphthalate	28.0	190.00	Fail
Dimethylphthalate	28.0	190.00	Fail
Fluoranthene	3.4	190.00	Fail
Fluorene	3.4	190.00	Fail
Hexachlorobenzene	10.0	190.00	Fail
Hexachlorobutadiene	5.6	190.00	Fail
Hexachloroethane	30.0	190.00	Fail
Indeno(1,2,3-cd)pyrene	3.4	190.00	Fail
Naphthalene	5.6	190.00	Fail
PCBs (all isomers)	10.0	35.74[c]	Fail
Pentachlorophenol	7.4	915.00	Fail
Phenanthrene	5.6	190.00	Fail
Phenol	6.2	190.00	Fail
Pyrene	8.2	190.00	Fail
Bis(2-chloroethoxy)methane	7.2	190.00	Fail
Bis(2-chloroethyl)ether	6.0	190.00	Fail
Bis(2-chloroisoproply)ether	7.2	190.00	Fail
Bis(2-ethylhexyl)phthalate	28.0	43.50 (J)[d]	Fail

a. This list includes only those UHCs for which data are available. The waste generator is responsible for determining all UHCs that may reasonably be expected to be present. The actual list of UHCs for V13 may be more extensive.
b. The average concentration is calculated from two U-coded (non-detect) concentrations. The actual concentration may be much lower.
c. The PCB concentration is based on detected concentration for certain isomers (e.g., Aroclor-1260) and U-coded concentrations for other isomers.
d. This chemical was detected with a J-flag, meaning the concentration is estimated.

PCB = polychlorinated biphenyl
TCLP = toxicity characteristic leaching procedure
UHC = underlying hazardous condition

Table A-2c. Comparison of Test Area North Tank V13 inorganics (metals) data to Resource Conservation and Recovery Act land disposal restriction universal treatment standards.

1	2	3	4	5	6	7	8	9	10	11
Inorganic Underlying Hazardous Condition [a]	Treatment Standard (TCLP) (mg/L)	Tank V13 Total (highest) (mg/kg)	Total Divided by 20[b] (mg/L)	Pass or Fail	Tank V13 Total Concentration: (avg+stdv)[c] (mg/kg)	Tank V13 Total Concentration: (avg+stdv)[c] Divided by 20[b] (mg/L)	Pass or Fail	Tanks V1, V2, and V3 Average Leach Ratio	Calculated TCLP Leach Concentration[d] (mg/L)	Pass or Fail
Antimony	1.150	17.2	0.9	Pass	19.7	1.0	Pass	No data	—	—
Arsenic	5.000	27.6	1.4	Pass	25.0	1.3	Pass	3.0E-03	7.5E-02	Pass
Barium	21.000	102.0	5.1	Pass	77.5	3.9	Pass	7.0E-03	5.4E-01	Pass
Beryllium	1.220	23.8	1.2	Pass	15.6	0.8	Pass	No data	—	—
Cadmium	0.110	70.7	3.5	Fail	49.2	2.5	Fail	3.6E-03	1.8E-01	Fail
Chromium	0.600	875.0	43.8	Fail	76.6	33.8	Fail	4.8E-04	3.2E-01	Pass
Cyanides (total)	590.000	No data	—	—	No data	—	—	—	—	—
Cyanides (amenable)	30.000	No data	—	—	No data	—	—	—	—	—
Lead	0.750	594.0	29.7	Fail	439.8	22.0	Fail	2.7E-05	1.2E-02	Pass
Mercury	0.025	79.7	4.0	Fail	70.8	3.5	Fail	1.2E-06	8.5E-05	Pass
Nickel	11.000	256.0	12.8	Fail	205.9	10.3	Pass	No data	—	—
Selenium	5.700	4.7	0.2	Pass	4.8	0.2	Pass	1.7E-02	8.2E-02	Pass
Silver	0.140	144.0	7.2	Fail	104.6	5.2	Fail	1.6E-05	1.7E-03	Pass
Thallium	0.200	44.7	2.2	Fail	36.7	1.8	Fail	No data	—	—

a. This table lists all inorganic UHCs, not all may apply to Tank V13. The waste generator is responsible for determining all reasonably expected UHCs.
b. EPA (1986).
c. Average of total concentration data plus one standard deviation (avg+stdv).
d. Assumes Tank V13 waste leaches at a rate similar to waste in Tanks V1, V2, and V3.

TCLP = toxicity characteristic leaching procedure
UHC = underlying hazardous condition

A.4 EXPLANATION OF TABLE A-3

Table A-3 classifies each of the listed radionuclides for Tank V13 samples to determine whether the waste can meet the ICDF radiological disposal criteria. The waste acceptance criteria (WAC) for the ICDF specify that no radionuclide may exceed Class C low-level waste, and that no alpha-emitting radionuclide with a half-life greater than 5 years may exceed a concentration of 10 nCi/g (U.S. Department of Energy Idaho Operations Office [DOE-ID] 2002a). By comparing the average concentration data with the classification and concentration limits, the proper classification for each radionuclide is obtained. All of the radionuclides for which data exist meet the ICDF WAC. No data exists for a few radionuclides; however, those radionuclides are not expected to impact the results reported here. The ICDF WAC also require that radioactive waste may not exceed a dose rate of 500 mR/hour at 1 m (DOE-ID 2002b). Preliminary calculations using the 1996 sample data, decayed to calendar year 2004, indicate that the expected dose rate will be approximately 11 mR/hour at 1 m for a 55-gal drum of waste or 100 mR/hour at 1 m for a roll-off container of waste.[b]

b. Sorenson, D. J., E-mail to T. G. McDonald, INEEL, August 19, 2002, "Radiation Exposure Estimate for PM-2A Tank Contents."

Table A-3. Classification of radiological waste in Tank V13.

Radionuclide	Class A Limit		Class B Limit		Class C Limit		Average Concentration in Waste		Rad-Waste Classification
	(Ci/m^3)	(nCi/g)	(Ci/m^3)	(nCi/g)	(Ci/m^3)	(nCi/g)	(Ci/m^3)	(nCi/g)	
C-14	8.0E-01	5.0-7.3 E+02[a]	NV	NV	8.0E+00	5.0-7.3 E+03[a]	ND	ND	
Tc-99	3.0E-01	1.9-2.7 E+02[a]	NV	NV	3.0E+00	1.9-2.7 E+03[a]	ND	ND	
I-129	8.0E-03	5.0-7.3 E+00[a]	NV	NV	8.0E-02	5.0-7.3 E+01[a]	ND	ND	
Pu-241	3.9-5.6 E-01[a]	3.5E+02	NV	NV	3.9-5.6 E+00[a]	3.5E+03	ND	ND	
Cm-242	2.2-3.2 E+00[a]	2.0E+03	NV	NV	2.2-3.2 E+01[a]	2.0E+04	1.7-2.4 E-06[a]	1.5E-03	A
Alpha TRU with half-life >5 years	1.1-1.6 E-02[a]	1.0E+01	NV	NV	1.1-1.6 E-01[a]	1.0E+02	2.8-4.1 E-03[a]	2.6E+00	A
Pu-238	—	—	—	—	—	—	—	5.4E-01	
Pu-239/-240	—	—	—	—	—	—	—	1.9E+00	
Am-241	—	—	—	—	—	—	—	1.5E-01	
Radionuclides with half-life < 5 years	9.8 E-01[b]	7.0E+02	NV	NV	NV	NV	ND	ND	
H-3	4.0E+01	2.5-3.6 E+04[a]	NV	NV	NV	NV	ND	ND	
Co-60	7.0E+02	5.0 E+05[b]	NV	NV	NV	NV	1.61 E-02[b]	1.1E+01	A
Ni-63	3.5E+00	2.2-3.2 E+03[a]	7.0E+01	4.4-6.4 E+04[a]	7.0E+02	4.4-6.4 E+05[a]	ND	ND	
Sr-90	4.0E-02	2.9 E+01[b]	1.5E+02	1.1 E+05[b]	7.0E+03	5.0 E+06[b]	2.02 E+00[b]	1.44E+03	B
Cs-137	1.0E+00	7.1 E+02[b]	4.4E+01	3.1 E+04[b]	4.6E+03	3.3 E+06[b]	6.35 E-01[b]	4.5E+02	A

a. Radionuclide concentration ranges calculated assuming density range of 1.1-1.6 g/ml

b. Radionuclide concentration calculated with measured density of 1.4 g/ml

A.5 REFERENCES

10 CFR 61.55, 2002, "Waste Classification," *Code of Federal Regulations,* Office of the Federal Register, December 2002.

40 CFR 261.24, 2002, "Toxicity Characteristic," *Code of Federal Regulations*, Office of the Federal Register, December 2002.

40 CFR 268.40, 2002, "Applicability of Treatment Standards," *Code of Federal Regulations*, Office of the Federal Register, November 2002.

40 CFR 268.49, 2002, "Alternative LDR Treatment Standards for Contaminated Soil," *Code of Federal Regulations*, Office of the Federal Register, November 2002.

42 USC § 6901 et seq., 1976, "Resource Conservation and Recovery Act (Solid Waste Disposal Act)," *United States Code*, October 21, 1976.

42 USC § 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code*, December 11, 1980.

DOE-ID, 2002a, *Waste Acceptance Criteria for ICDF Landfill*, DOE/ID-10865, Rev. 2, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, May 2002.

DOE-ID, 2002b, *ICDF Complex Waste Acceptance Criteria*, DOE/ID-10881, Rev. 0, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho, March 2002.

EPA, 1986, *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, Third Edition, EPA SW-846, U.S. Environmental Protection Agency, November 1986.

INEEL, 2001, "Statement of Work for the Removal, Treatment, and Disposal of V-Tank Wastes and Associated Equipment," Rev. 2, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, January 2001.

INEEL, 2000, *Data Quality Objectives Summary Report for the PM-2A Tanks (TSF-26),* EDF-ER-217, INEEL/EXT-2000-01099, Rev. 0, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, December 2000.

Appendix B

U.S. Environmental Protection Agency Comment Resolutions on Design Study

INEEL
Idaho National Engineering & Environmental Laboratory

PROJECT DOCUMENT REVIEW RECORD

DOCUMENT TITLE/DESCRIPTION: Conceptual Design Study Report for TSF-26 PM-2A Tanks for Test Area North, OU 1-10

DATE: December 18, 2002 **REVIEWER:** Environmental Protection Agency

ITEM NUMBER	SECTION NUMBER	PAGE NUMBER	COMMENT	RESOLUTION
GENERAL COMMENTS				
SPECIFIC COMMENTS				
1.	3.4	7	This section discusses the use of an air lance and vacuum system to dislodge and remove waste material. This is performed after the top of the tanks are removed. There is no discussion of how emissions will be controlled. There is a discussion of the use of HEPA filters to prevent emissions when filling the drums. While EPA realizes that this is not a work plan, since there is mention of preventing emissions from filling drums some discussion of how emissions will be controlled at the dig face should be included.	Comment incorporated. The following sentence was added to this section: "To minimize the spread of airborne contamination during contents removal, application of a fine water spray/mist at the "dig face" will be investigated during the design process. The operator will be required to wear appropriate personnel protective equipment." Also note (last sentence of section) that an enclosure over the tank is anticipated to minimize contamination outside the tank area.
2	3.5, 3rd full paragraph	8	The second sentence notes that the tanks are RCRA listed because of the potential presence of TCE. If TCE is not present, as determined by sampling, is the RCRA listing associated with the tanks removed?	Comment noted and discussed per telecon 12/19/02. Since the PM-2A tanks received waste from the V-tanks that carried the F001 code associated with TCE, the listed waste designation applies despite the actually concentration of TCE found. Unless a delisting petition is sought, which is not planned, the designation remains. Evaporation of the waste to remove the TCE is not sufficient without also delisting the waste. ICDF can accept listed waste from TAN as long as LDRs are met. No change to document planned.

INEEL
Idaho National Engineering & Environmental Laboratory

PROJECT DOCUMENT REVIEW RECORD

DOCUMENT TITLE/DESCRIPTION: Conceptual Design Study Report for TSF-26 PM-2A Tanks for Test Area North, OU 1-10

DATE: December 18, 2002 **REVIEWER:** Environmental Protection Agency

ITEM NUMBER	SECTION NUMBER	PAGE NUMBER	COMMENT	RESOLUTION
3	Figure 3	10	EPA recommends adding a decision point between the "Send to ICDF for disposal" box and the "Decontaminate tank sections and back fill" box. Testing should be performed to determine if decontamination is necessary. Section 3.7 indicates that the new approach should be adequate to decontaminate the tanks.	Comment incorporated. However, rather than add an additional decision point, the "decon" box was modified as follows: "Further decontaminate tank sections (as required) and backfill."
4.	Table 2	11	What accounts for the dramatic increase in costs for Remedial Assessment Document Preparation, Title Design Package, and Remedial Design Document from the original costs noted in the ROD? Also, what accounts for the dramatic decrease in the cost of soil excavation and disposal?	Comment incorporated. Added the following note to the table on the cost increase: "The original estimate was understated. The new estimate is based on comparable projects, but recent bids are considerably less." And added the following note to the table on the cost decrease: "The original estimate assumed off-site disposal whereas the new estimate is based on ICDF disposal."

Appendix C

Idaho Department of Environmental Quality Comment Resolutions on Design Study

INEEL

Idaho National Engineering & Environmental Laboratory

PROJECT DOCUMENT REVIEW RECORD

DOCUMENT TITLE/DESCRIPTION: Conceptual Design Study Report for TSF-26 PM-2A Tanks for Test Area North, OU 1-10

DATE: December 18, 2002 **REVIEWER:** Idaho Department of Environmental Quality

ITEM NUMBER	SECTION NUMBER	PAGE NUMBER	COMMENT	RESOLUTION
GENERAL COMMENTS				
1.			Please be prepared to discuss specifics of the "Cost Comparisons" in Table 2, page 11. There are enough significant differences between the original and new cost estimates that a discussion of the deltas would be informative.	Comment incorporated. For the major cost differences, like title design and soil disposal, an explanation was added to the table.
SPECIFIC COMMENTS				
1.	2, 2nd Paragraph, 1st Sentence	1	Please provide specificity (one concise sentence would probably suffice) for "relative to the V tanks... ", or add a suggested addition such as "relative to the proposed changes to the V-tanks selected remedy...".	Comment incorporated. The sentence was modified as suggested: "Performance of this design study was prompted by the need to revise portions of the OU 1-10 ROD relative to the proposed changes to the V tanks (another OU 1-10 site) selected remedy."
2	Ibid, Remainder of second paragraph	1	the present tense. The scope description is referring to this document, not one prepared in the past, and is somewhat confusing, as written, in terms of what document is being referred to.	present tense.
3	2.1, 4th Paragraph	2	Based on the information provided, the waste remaining in the tanks is FOO1 listed hazardous waste. Please provide additional information or clarification regarding the analytical results which indicate organic constituents were not detected in the waste.	Comment incorporated. The following sentence was added to the end of the paragraph: "Appendix A contains results from the 1996 sampling campaign that illustrate the limitations of the existing data, particularly the high detection levels for the organic compounds."
4.	2.2, Item 8	4	Please explain "functional restoration guidelines (FRG)". FRG is usually taken to indicate a Final Remediation Goal.	Comment incorporated. Final Remediation Goal is the proper term and was corrected throughout the document.

INEEL
Idaho National Engineering & Environmental Laboratory

PROJECT DOCUMENT REVIEW RECORD

DOCUMENT TITLE/DESCRIPTION: Conceptual Design Study Report for TSF-26 PM-2A Tanks for Test Area North, OU 1-10

DATE: December 18, 2002 **REVIEWER:** Idaho Department of Environmental Quality

ITEM NUMBER	SECTION NUMBER	PAGE NUMBER	COMMENT	RESOLUTION
5.	3, 2nd Paragraph	5	A recommendation for a more concise presentation of this paragraph is the following: "The new preconceptual design approach corresponds directly with each of the ten major components, *listed in Section 2.2*, of the *selected remedy for the P M-2A tanks' described* in the OU 1-10 ROD. The only design differences between the new and original approach relate to how the remedy will be implemented,…."	Comment incorporated using suggested wording.
6.	3.5	8	Section 3.5 assumptions need to be supported by sampling verification, as tentatively proposed in the last paragraph of this section. Once the sampling event has been completed, a determination can be made if additional treatment is required to meet LDRs. In any case, since this is a listed waste, it must meet all applicable standards and be in an appropriate waste form to be disposed in the ICDF.	Comment incorporated. Since the writing of this report, funding was obtained for sampling the waste in the tanks in FY-03. The note in Section 3.3 was changed as follows: "Note: Additional sampling before removal of the contents, for the purposes of confirming whether waste treatment will be required, is planned in 2003 and will be addressed in a separate Field Sample Plan." Also, the last sentence of Section 3.5 was changed as follows: "Because of this uncertainty, sampling of the PM-2A Tanks is planned before the remediation efforts to allow time for the design of any necessary treatment system. (See note to Section 3.3.)"
7	4, 2nd Paragraph and Table 2	11	Please explain what "Items" in Table 2 make up the "estimated cost for the remedial design and assessment documentation" of $1.5 million.	Comment incorporated. Sentence modified to reflect the actual sub-headings in the table as follows: "This is because the estimated cost for the remedial assessment document preparation, title design package and remedial design document was $1.5 million;…"

INEEL
Idaho National Engineering & Environmental Laboratory

PROJECT DOCUMENT REVIEW RECORD

DOCUMENT TITLE/DESCRIPTION: Conceptual Design Study Report for TSF-26 PM-2A Tanks for Test Area North, OU 1-10

DATE: December 18, 2002 **REVIEWER:** Idaho Department of Environmental Quality

ITEM NUMBER	SECTION NUMBER	PAGE NUMBER	COMMENT	RESOLUTION
8	A.4, Table A.3	A.11	The document assumes that the tank contents can be disposed at the ICDF because it meets the ICDF WAC for radionuclide limits. The table is a bit busy in its presentation of this assumption. It would be enhanced if only the ICDF WAC limits, were listed, i.e. Class C radioactive waste limit, as defined in 10 CFR 61.55 for all non-TRU. Listing the Class C Ci/m3 limit is okay but the equivalent in pCi/g with exponent or nCi/g without exponent is also desired for clarity. TRU constituents should be addressed with >10 nCi/g as the limiting factor, not pCi/g, again for clarity .	Comment incorporated. Table was completely redone showing Class A, B & C limits and waste concentrations in Ci/m3 and nCi/g. The final column in the Table indicates what Class the waste qualifies as for the identified constituent. The explanation section above the table was modified accordingly.